

MECHANISMS TO MANAGE MEDICAL INSTITUTES IN TIMES OF EMERGENCY

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ABSTRACT

Surgical wound infections pose a major problem for many patients, especially pregnant women when they are exposed to bacterial infections during a surgical procedure. When visiting the hospital for surgical dressing, or staying there for complete recovery. The study aims to determine the types of bacteria contaminating wounds during surgical operations on pregnant women and to record the effect of antibiotics and their effectiveness on these isolated bacterial types. The study was conducted at Al-Kindi Hospital in Baghdad on 9/20/2023 and 1/17/2024, where 46 samples were collected. The study included diseases of the tonsils, appendicitis, gallbladder, hemorrhoids, colon, and cesarean sections. The treating physician's assistant took the sample by passing and rotating a piece of cotton. Blood samples were drawn and sent to the laboratory for analysis, to be incubated for 24 hours at 37 degrees Celsius before being cultivated. The samples were cultured and tests were conducted on them. Biochemical results showed that 13 of the studied samples (28%) were bacterial growth-free. In comparison, 33 of the samples (72%) showed bacterial growth, some of which were positive on the Gram stain (*Staphylococcus aureus* and *Staphylococcus aureus*)—*Streptococcus* spp. and other types of Gram-negative bacteria (*Klebsiella* spp, *Pseudomonas* spp, *Escherichia coli*), and most antibiotics are also effective. Antibiotics are used in surgeries and the surgical department to diagnose these types of contaminated bacteria, as they require accuracy in giving the antibiotic appropriately, adhering to the doses on time, monitoring the health of the pregnant woman periodically, and disinfecting clothes appropriately. Infection is also prevented by cleaning the wounds. and disinfection of places. Until the infection is completely cured..

KEYWORDS: Bacterial infections, surgical operations, antibiotics, pregnant women

BACKGROUND

Endalafer and others concluded a study conducted in a hospital in Ethiopia and confirmed that the infection rate in this hospital was high, reaching 35.8 per 100 cases. [1] The number of infection cases reached 77, with the percentage of Gram-positive bacteria (31%) and Gram-negative bacteria (69%) [2]. In a study conducted in Al-Khansaa, Al-Zahrawi, and General Hospital in the city of Mosul, germs found in the environment and operating rooms were isolated and diagnosed, and the isolated species included Gram-negative species represented by *Klebsiella* Enterobacter, *Pseudomonas*, *Escherichia*, *Serratia*, *Alcaligenes*, *Proteus*, *Citrobacter*, *Hafnia*, *Providenciae*, And some Gram-positive species such as *Aureus Staph*, *Faecalis Strep*, and *Agalactiae Strep*. [3] *B. coagulans*, *B. cereus*, and *B. subtilis*. In a study by Giacometti and others at San Salvatore Hospital in Italy, they studied 676 surgical cases who had symptoms in their wounds, and the bacteria causing these symptoms were isolated from 614 of them, and the isolated species was *Staphylococcus aureus* in 191 cases 28.2% [4,5] Studies conducted by Khan and others in Pakistan showed the main bacterial species causing hospital infections have become health and economic problems. *Aureus Staphylococcus*, *Pseudomonas aeruginosa*, *Enterococci*, *Logionella*. Coagulase-negative *Staphylococcus*, *Streptococcus* spp, *Acinetobacter* spp, and *Bacillus*. *Escherichia coli*, *Proteus*, *Klebsiella pneumonia*, *Serratia* (*Enterobacteriaceae* family and species). [6] Marcescens in the Togo study conducted at the teaching hospital in Mali in 2007, showed that 44 out of 460 samples were infected with this the hospital included 31 cases, including after surgical operations and the most common bacterial infection was *Escherichia coli* [7] Based on a study by Carlotta in Germany, it was found that hospital infections increased and raised the level of morbidity and death, and they confirmed that this increase was clear. From 117 patients, 124 bacterial isolates were isolated, and the isolated bacterial species were *Candida* spp, *Pseudomonas aeruginosa*, and Coagulase-negative staphylococcus (*Enterobacter* spp). Canturk confirmed the presence of 117 infections in 96 cases out of a total of 395 patients who underwent surgical operations, and most of the cases were overweight people. [8,9,10] Kurhade and others in India, which was conducted on 800 patients who were admitted to the surgical department, including 116 cases suffering from wound infections with bacteria, the types isolated were *aureus Staphylococcus*, *Pseudomonas*, Coagulase-negative staphylococcus, *Klebsiella pneumonia*, *Escherichia coli*, and *aeruginosa*. *Proteus*, *Peptococcus* spp, *Beta Haemolytic streptococci*, *Proteus mirabilis*, *Bacteroides vulgoris* spp, and *Citrobacter* spp, as most of the isolated species of negative and positive bacteria were resistant to antibiotics. [11]

1.1. Introduction

Bacterial infections are among the most important infections that occur after surgical operations and wounds, whether superficial or deep. It has been observed that some surgical operations are delayed in their healing due to negligence and not diagnosing the factor causing the infection, or because the patient stays for a long time in the hospital, in addition to patients' frequency of treatment. Outpatient clinics increase the chance of infection with these bacteria. Antibiotics are medicines used to treat bacterial infections. perhaps ineffective Against many viruses and infections. Antibiotics kill or prevent bacteria from multiplying, boosting the body's natural defenses to eliminate them. Antibiotics considered safe during pregnancy: Penicillins, including amoxicillin (Amoxil and Larotid) and ampicillin. Cephalosporins, including cefaclor cephalixin (Keflex) and Clindamycin (Cleocin, Clinda Derm, Clindagel).[12]

1.2. The quality of disinfectants and sterilizers

a result of these circumstances and due to the lack of awareness, regardless of the type of wound, health, and sometimes negligence, wound contamination, and infection have become a common occurrence that may lead to serious consequences that could have been avoided by keeping surgical wounds clean, covering them, and using appropriate antibiotics, because that's considered crowded places, especially closed places Such as polluted areas as sources of microbes. The quality of disinfectants and sterilizers used in low concentrations before and after surgical operations, the use of improperly sterilized surgical instruments, the failure to purify the air of operating rooms, and the lack of cleanliness of medical staff play an important role in transmitting microbes and contaminating wounds. [13,14]In the United States of America, the number of surgical operations performed during the year is estimated at approximately 27 million. Statistics have shown that infection of wounds after surgical operations with bacterial infections is the third most common hospital infection. Its percentage ranges from (14-16% percent) of all infections that occur among hospital residents.[15].The most important bacteria that cause hospital infections are MRSA, vancomycin-resistant Staphylococcus aureus (VRSA), Pseudomonas aeruginosa, carbapenem-resistant Enterobacteriaceae, vancomycin-resistant enterococci (VRE), Negative Coagulase staphylococci and Acinetobacter baumannii, and the list is increasing. The complexity has increased and we are now talking about dynasties resistant to all types of antibiotics available. This makes treating them very difficult, and for this reason, preventing infection with these microbes is the most acceptable strategy in this context. [16]

1.3. Controlling infection or injury

that occurs in surgical wounds includes improving sterilization methods, ventilation in operating rooms, and providing antibacterial agents as a preventive measure. Despite this, surgical wound infections were and still are the real cause of injury and death among hospital residents, and this can be explained by enhancing and strengthening the immune system and reducing the impact of dangerous bacterial strains resistant to detergents and sterilizers, effective and organized sterilization methods must be followed, as well as increasing full awareness to reduce their danger to the patient and medical personnel during surgical operations in hospitals. [17].Studies by the World Health Organization have shown that wound infections are the most frequent type of healthcare infection in low- and middle-income countries and cause disease problems for patients undergoing surgical operations in these countries and to a lesser extent for high-income countries. It is Europe and America's second most prominent type of healthcare infection. [18]Microbial infection in wounds, especially after surgical operations, which occurs within 7-10 days of the operation, is a major problem that threatens the lives of many patients, especially in the presence of contributing factors, including lack of sterilization and treatment, long periods of stay in the hospital, and lack of health care, with the presence of the main cause, which is Bacteria, whether coming from the external environment or existing as a natural resident on the skin of the patient, those around him, or those who visit him, which takes advantage of the opportunity to break and wound its natural barrier, which is the skin, or the immune deficiency with the wound, thus causing pathogenicity and exacerbation of the problem.[19]Among the most frequent places for hospital infections are surgical, urology, and pediatric departments, then intensive care. and resuscitation, followed by lower respiratory tract patients, which led to an increase in the prevalence of this infection and deaths every year until it became a rate of one case every 6 minutes.[20]A recent study showed that pregnant women are not at risk of developing any infections or other complications after cholecystectomy and appendix removal compared to non-pregnant women. Researchers have confirmed that if a woman suffers from appendicitis during pregnancy, there is no risk when removing it, and it is preferable not to postpone it due to pregnancy. However, no previous study has compared the outcomes of operations between pregnant women and other women. Information from researchers was collected on 1,300 pregnant women and more than 51,000 women of approximately the same age. Through more than 800 pregnant women who underwent an appendectomy. 4 out of every 100 women developed complications within a month of the procedure, including infection, blockage, death, heart attack, or return to the operating room. Of the 19,000 non-pregnant women who had their appendix removed, 3 out of every 100 women developed such complications. Out of every 100 women, two women suffered complications after cholecystectomy, and the rate was equal among pregnant women or others. [21,22]researchers add that if a woman suffers from appendicitis during pregnancy, there is no risk when removing it, and it is preferable not to postpone it due to pregnancy. Penicillins are a subclass of antibiotics called beta-lactam antibiotics (antibiotics that have a chemical structure called a beta-lactam ring). Carbapenems, cephalosporins, and monobactams are also beta-lactam antibiotics. Penicillins treat infections

caused by gram-positive bacteria (such as streptococcal infections) and some gram-negative bacteria (such as meningococcal infections). [23]

Table 1. Antibiotics used and abbreviations

| Sequence | anti-biotic | abbreviation | Dosage |
|----------|----------------|--------------|--------|
| 1 | Amikacin | AK | 30mg |
| 2 | Amoxicillin | AMC | 30mg |
| 3 | Cefotetan | CTT | 30mg |
| 4 | Cefoxitin | FOX | 10mg |
| 5 | Cephalexin | CL | 30mg |
| 6 | Ceftriaxone | CRO | 30mg |
| 7 | Cefuroxime | CXM | 30mg |
| 8 | Ciprofloxacin | CIP | 5mg |
| 9 | Erythromycin | E | 15mg |
| 10 | Gentamycin | CN | 10mg |
| 11 | Mezocillin | MEZ | 75mg |
| 12 | Nitrofurantoin | FIM | 30mg |
| 13 | Piperocillin | PRL | 100mg |
| 14 | Vancomycin | VA | 5mg |

2. WORKING METHODS

Samples were taken by passing and rotating a swap cotton swab by the treating physician's assistant. Out of 46 samples from patients with tonsils, appendix, gallbladder, hemorrhoids, colon, and cesarean sections, the samples were then transferred to the laboratory, and after incubating the samples in Nutrient broth for 24 hours. The samples were planted on blood agar, chocolate agar, and McConkey agar, and after incubation for 24 hours at a temperature of 37°C, the apparent characteristics of the growing bacteria were observed, such as the shape of the colony, the fermentative ability of lactose, their analysis of blood, their production of dyes, and other characteristics. Then the Gram stain was used to identify the shape of the bacteria and to distinguish between positive and negative bacteria for the dye, by following the traditional method. [24,25]

Cowan also conducted a catalase test to distinguish the positive *Staphylococcus* spp from the negative *Streptococcus* spp test, by mixing a pure colony with a drop of hydrogen peroxide (H₂O₂) (concentration of 3%) on a glass slide. Air bubbles immediately form, indicating Test positivity. Also, results in which the gas does not arise directly should not be taken into account. The Coagulase test was also conducted to determine the ability of bacteria to secrete the enzyme Coagulase, which works to coagulate and clot blood plasma, as it converts fibrinogen to fibrin. This test was conducted mainly to distinguish the pathogenic *Staphylococcus aureus* *Staphylococcus*. pathogenic bacteria that can secrete this enzyme from other non-pathogenic staphylococci. The oxidase test was also performed to distinguish the genus of *Pseudomonas* spp that was positive for this test from the rest of the genera belonging to the Enterobacteriaceae family. A citrate test was also performed, which is a test that detects bacteria. Citrate is used as the sole source of carbon. For this purpose, Simon's citrate culture is used. When bacteria grow in this culture, the color of the culture turns from green to blue as a result of the pH shifting to alkaline, and this dusting in color confirms the presence of bacteria such as *Sppseudomonas* and *Escherichia coli*. [26]

The sensitivity of the bacterial isolates to a group of antibiotics was tested using the Bauer-Kirby diffusion disk method. The culture was done on Hinton Muller medium using cotton swabs from the bacterial suspensions after their turbidity was adjusted compared to a 0.5 McFarland solution. The plate was left to dry and then distributed. The tablets for each plate were incubated at 37°C for 24 hours, after which the diameter of the inhibition zone was measured and the sensitivity to each antibiotic was estimated by referring to standard tables. [27,28]

3. RESULTS AND DISCUSSION

After conducting laboratory tests and statistical analysis, it was found, as in Figure (1), that 13 of the samples studied (28%) were free of bacterial growth. While 33 samples (72%) showed bacterial growth, some were Gram-positive (such as *Streptococcus* spp, and *Staphylococcus aureus*). Gram-negative (*Escherichia coli*, *Pseudomonas* spp, and *Klebsiella* spp). The study showed that Figure (2) was the highest bacterial presence for *Staphylococcus aureus* at a rate of (59%), followed by *Pseudomonas* spp at a rate of (13%). *Klebsiella* spp at a rate of (12%). then *Escherichia coli* and *Streptococcus* spp at a rate of (7%) for each.

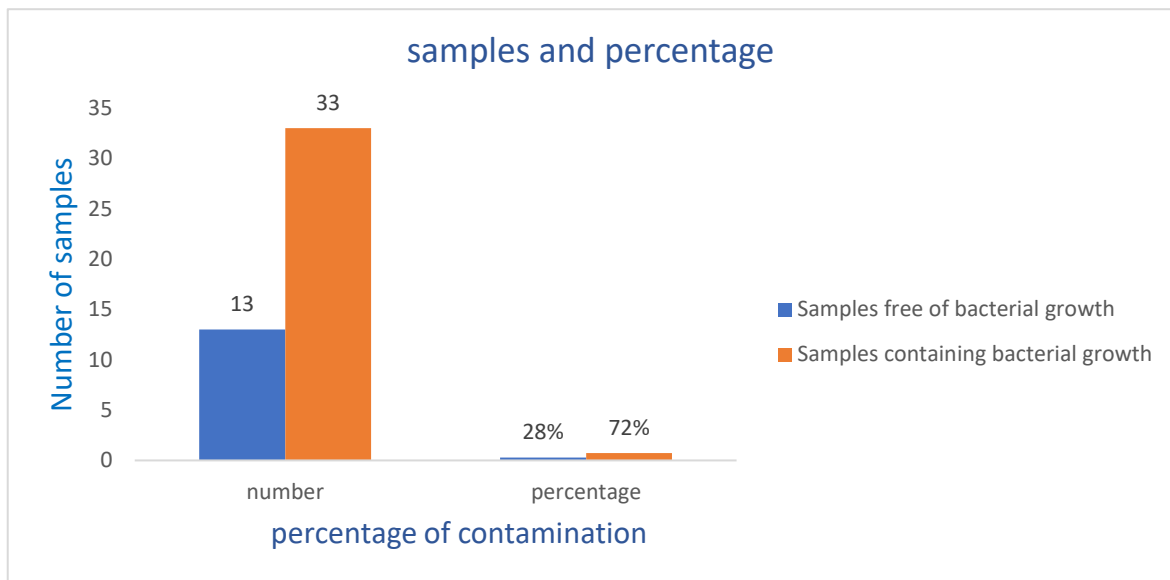


Figure 1. Number of samples and percentage of contamination

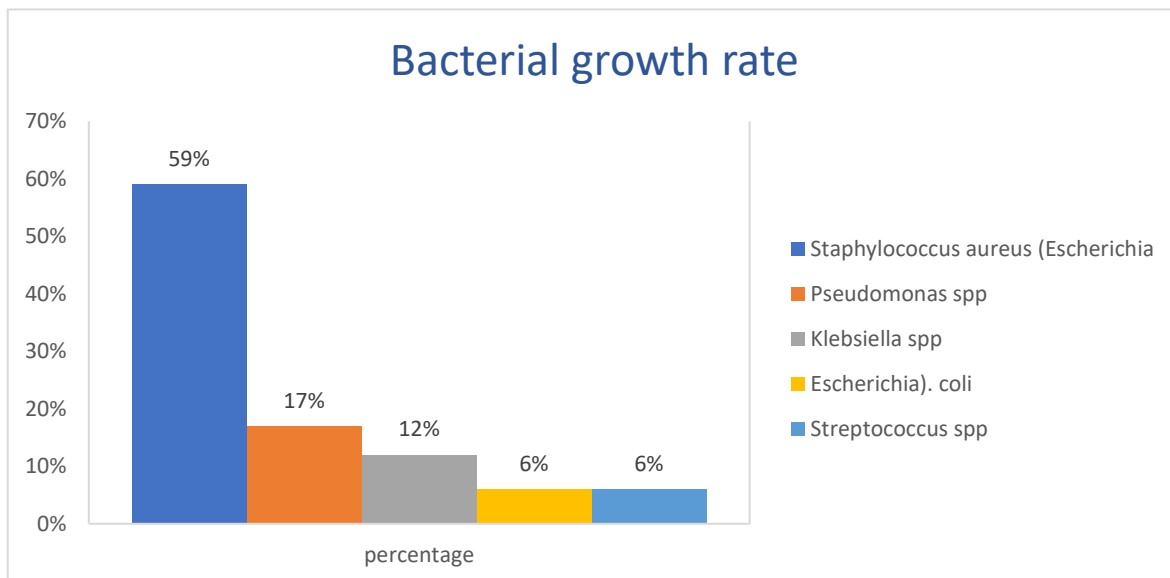


Figure 2. Showing Bacterial growth rate

the study agreed with Kurhad in India [11]. as well as the study by Nouri and Sharif, in Iraq [29]. In most of the isolated species, it conflicted with the study of Myle Ott in Germany [9] and Togo in Mali [30]) most of the bacteria were isolated, while some bacteria were isolated in a study by Giacometti in Italy.[31]

.When conducting sensitivity tests on antibiotics, the effect of these antibiotics varied according to each antibiotic by measuring the diameter of the growth inhibition halo obtained. The focus was on the antibiotics used and in circulation, which sometimes differs between those used on Gram-positive bacteria and those used on Gram-negative bacteria.The results showed high sensitivity of Staphylococcus aureus bacteria to the antibiotics Cefuroxime Ciprofloxacin, Gentamycin, Cefoxitin, Nitrofurantoin, and Amoxicillin, moderate sensitivity to Vancomycin, Cefotetan and Ceftriaxone and no sensitivity to Erythromycin on them, while Streptococcus spp bacteria had high sensitivity to all antibiotics used and the diameter of the areola varied from 15 mm to 30 mm, as shown in Figure (3) and Table (2).

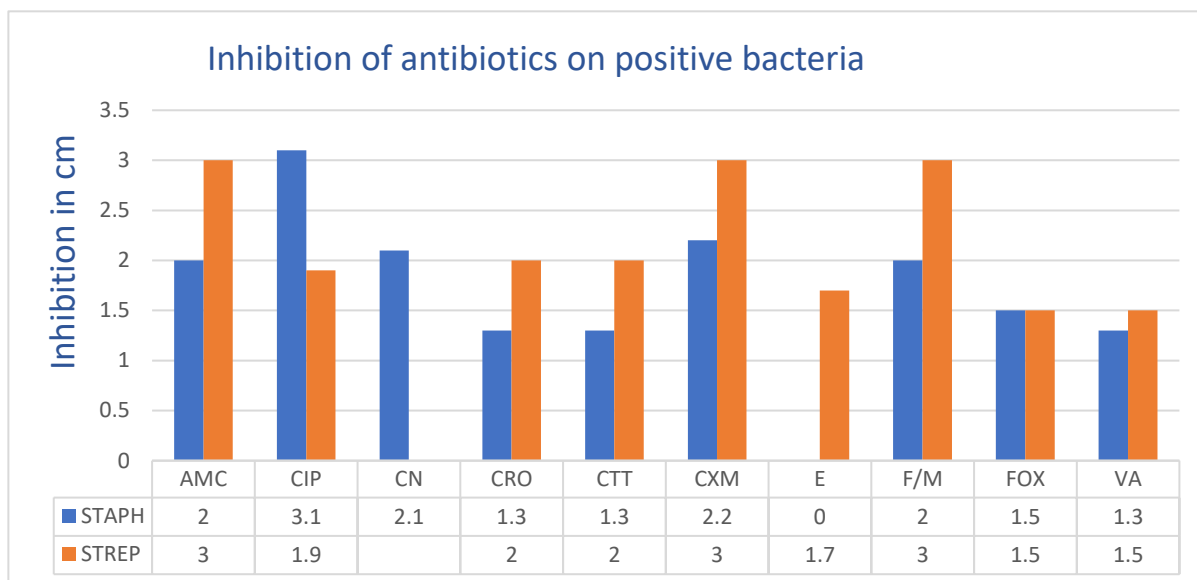


Figure 3. Inhibition of antibiotics on positive bacteria diameter by cm

Table 2. shows the sensitivity of Gram-positive bacteria to antibiotics

| Gram-positive bacteria | AMC 30 | AV 5 | CIP 5 | CN 10 | CRO | CTT 30 | CXM 30 | E 15 | FIM 30 | Fox 10 |
|--------------------------|-----------------------------------------------|------|-------|------------------------------------|-----|--------|-------------------------------------------------|------|--------|--------|
| Streptococcus spp | I | S | I | R | S | I | I | I | S | I |
| Staphy aureus | I | S | S | S | R | R | I | R | S | I |
| Clarification of symbols | R=Resistance There is no resistance effect | | | I = Intermediate Average effect | | | S = Sensitive There is an effect (sensitive) | | | |

The results also showed the extent of the effect of the antibiotics used on negative bacteria isolated from post-operative patients, including Klebsiella spp, Escherichia coli, and Pseudomonas spp. The highest effect of Klebsiella spp was for the antibiotic Cefotetan, followed by Amikacin, then Ciprofloxacin, with a weak sensitivity of these bacteria to Ceftriaxone, Meziocillin, and the ineffectiveness of the rest of the antibiotics on them, while Escherichia coli bacteria were the highest sensitive to the antibiotic Cefotetan and Ceftriaxone, followed by Amikacin and Gentamycin, then with a lesser effect for both Piperocillin and Cephalexin and a weak effect for both Meziocillin and Amoxicillin and insensitivity to the antibiotic Ciprofloxacin, while Pseudomonas spp bacteria showed High sensitivity to the antibiotic Ciprofloxacin, followed by Piperocillin, Amikacin, Meziocillin, then Gentamycin, with no sensitivity to Ceftriaxone, Cephalexin, and Cefotetan, **Table(3)** and **Figure (4)**

Table 3. shows the effect of antibiotics on isolated Gram-negative bacteria

| Gram-negative bacteria | AK 30 | AM C 30 | CIP 5 | CRO 30 | CN 10 | CL 30 | CTT 30 | MEZ 75 | PRL 30 | |
|--------------------------|-----------------------------------------------|---------|-------|------------------------------------|-------|-------|-------------------------------------------------|--------|--------|--|
| E. Coli | s | R | R | S | S | I | S | R | R | |
| Klebsiella | s | R | R | R | R | R | S | R | R | |
| Pseudomonas | s | R | S | R | S | R | R | S | S | |
| Clarification of symbols | R=Resistance There is no resistance effect | | | I = Intermediate Average effect | | | S = Sensitive There is an effect (sensitive) | | | |

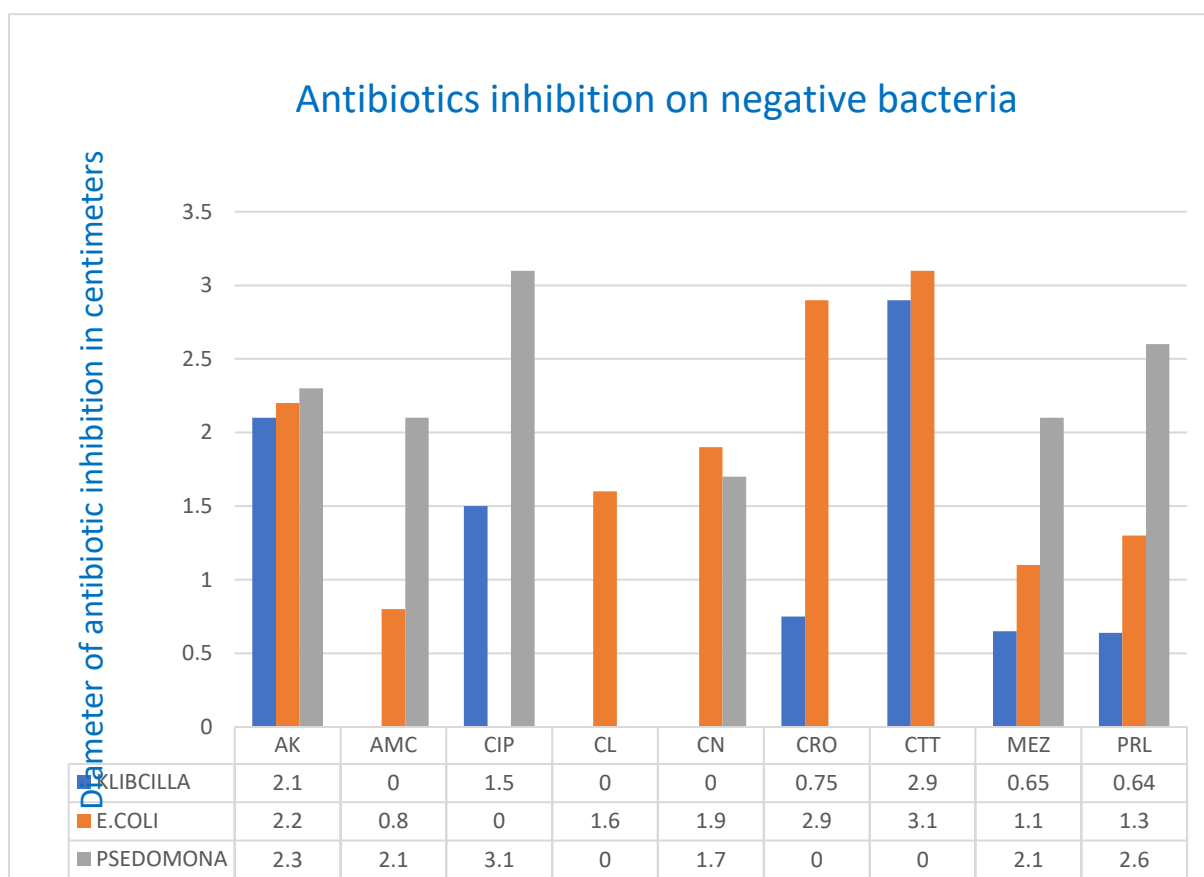


Figure 4. The effect of antibiotic inhibition on negative bacteria causing infections in a wound

4. Recommendations

The health of pregnant women and the fetus, and to avoid contracting bacterial infections when they are visited for examinations and performing surgical operations, is of great importance. All healthcare measures must be taken and to overcome the infection, the following must be followed: -

A-Evaluating the efficiency of the operating room and surgical instruments, with periodic examination of the effectiveness of the sterilization devices and disinfectants used, and the necessity of the medical staff's commitment to washing hands when dealing with patients as a first step to reducing infection.

B-Periodically isolate bacteria from the hospital environment and determine their sensitivity to antibiotics and antibiotics used.

C- Paying attention to studying the natural microbial inhabitants of doctors and accompanying medical staff to know their types and sensitivity to antibiotics.

D-Use scientific strategic plans to identify antibiotics, and reduce their danger except when necessary. The correct antibiotic must be chosen according to the sensitivity test in the laboratory.

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